Is it a Function?

Strands:

Quantitative Literacy & Logic (L)	
Algebra & Functions (A)	X
Statistics & Probability (S)	
Geometry & Trigonometry (G)	

Play a game to help you distinguish between relations that are functions and relations that are not functions. Create your own set of cards.

Materials:

- Set of "Is it a Function?" cards with examples of functions and examples of relations that are not functions.

1 What is a function? Refresh your memory by reading about the distinction between functions and non-functions on the following page.

2. A set of "Is it a function?" cards are provided. Each card gives an example of a function or an example of a relation that is not a function. The "independent" variable is indicated first. If the card has a table on it, the first column indicates the independent variable. If the card lists ordered pairs (a, b) then the items in the "a" position represent the independent variable. For graphs, the independent variable is indicated by the category listed along the horizontal axis. In a story, the independent variable is the one on which the other variable depends.
3. Play "Is it a Function?" with your friends or family. Start by explaining what a function is to other players. Shuffle the cards and deal out 5 cards per person.
4. On their turn, players sort a card into one of two piles, one for functions and one for non-functions. The other players monitor the card placement.
   a If all agree that the placement is correct, then play continues to the player on the left.
   b. If the placement is incorrect, then the player is told why the choice is incorrect, picks up the card and one from the draw pile, then play moves to the left.
5. The first person to go out (play all cards in his or her hand) is the winner.

Where?

Outside	
Inside	X
On-line	
On-site	

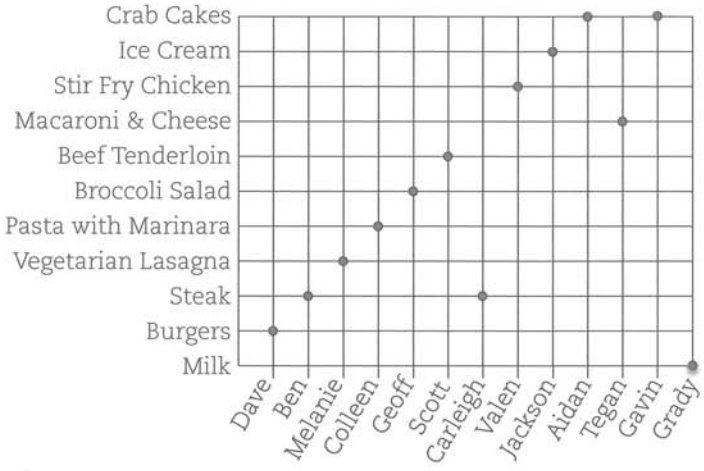
Create your own cards to go with the game. Challenge yourself to create at least one function and one relation that is not a function for each type of representation.

Person	Favorite Food
Dave	Burger
Ben	Steak
Melanie	Vegetarian lasagna
Colleen	Pasta with marinara
Geoff	Broccoli salad
Scott	Beef tenderloin
Carleigh	Steak
Valen	Macaroni and cheese
Jackson	Stir fry chicken
Aidan	Ice cream
Tegan	Macaroni and cheese
Gavin	Crab cakes
Grady	Milk

A function is a relationship between two categories for which each element in the first category has exactly one element in the second category corresponding to it. (Categories can include lists of words, sets of numbers, or one of each.) Consider the following example: Each person chooses a favorite food; even if someone likes several kinds of food, the person must choose only one favorite. Even if someone doesn't really like any of the foods listed, he or she still must choose one. This is an example of a function. For each person, there is only one type of favorite food. The list at left shows that for each person listed, each has only one favorite food. Note that more than one person can choose the same favorite, but each person can have only one favorite.

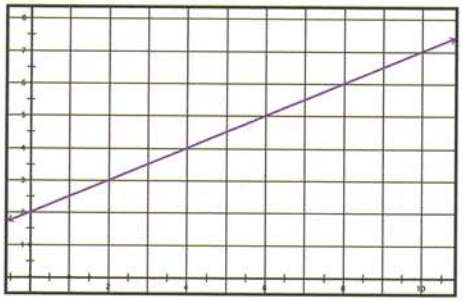
Favorite Food	Person
Burger	Dave
Steak	Ben, Carleigh
Vegetarian lasagna	Melanie
Pasta with marinara	Colleen
Broccoli salad	Geoff
Beef tenderloin	Scott
Macaroni and cheese	Valen, Tegan
Stir fry chicken	Jackson
Ice cream	Aidan
Crab cakes	Gavin
Milk	Grady
Cabbage soup	

If the roles of the categories are reversed, if, for example, we list foods and then list persons for whom that food is the favorite, the relationship is not a function for the list of people above. More than one person has chosen the same favorite food and no one has chosen cabbage soup. The table, when listed by favorite food as the "independent" variable, looks like the one at left. For favorite food, macaroni and cheese, there are two people who fall into this category.



Another way to look at functions versus relations that are not functions is to graph the relationship. List each person's name under the horizontal axis, one tick mark for each person, then list favorite foods along the y-axis. Place a dot above a person's name and across from the food that is his or her favorite. Notice that there is exactly one dot per person. There can be many dots or none per food, because this relationship is not a function in terms of food but is a function in terms of persons.

(Zach, dog)
(Miles, fish)
(Xavier, bird)
(Evelyn, doll)



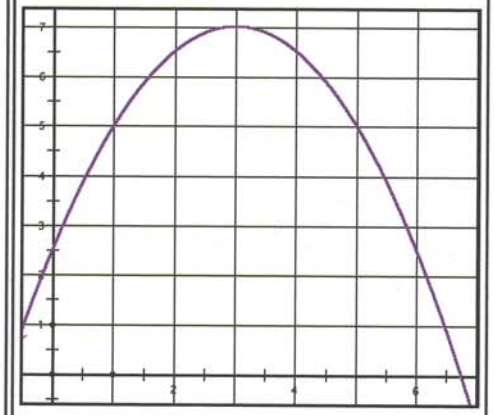
Person	Favorite Ice Cream
Gabe	Mackinaw Island Fudge
Rene	Blue Moon
Eric	Chocolate Chip
Alan	Cherry Cheesecake
Dorian	Strawberry

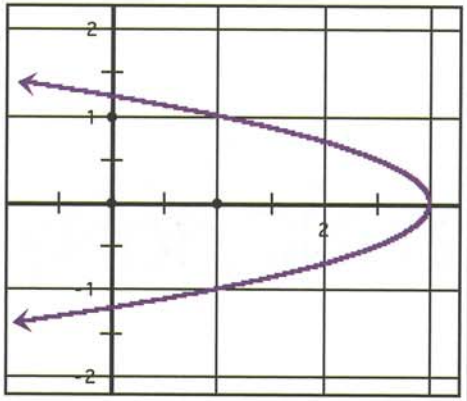
To make a necklace that is 16 inches long, the number of beads needed depends on the size of the bead. How many beads, b, are needed to make a 16 inch strand using beads that are c cm in dimension?

In the story, Counting Crocodiles, a monkey counts crocodiles. The crocodiles line up in separate groups so the monkey can count them. Groups have 1, 2, 3, …, c crocodiles in them. What is the total number of crocodiles in the first n groups?

City	State
New York	New York
Rochester	Michigan, Minnesota
Grand Rapids	Michigan, Minnesota
Berkeley	West Virginia, California
Georgetown	Virginia, West Virginia, New York

(127, –42), (3198, 491),
(–42, 127), (75, 100),
(3198, 491),





(56, 61.5), (56, 67.75),
(15.5, 71), (36, 72),
(34, 61.5), (31, 63),
(29, 66), (25, 63),
(3, 30), (3, 30),
(3, 33), (0.2, 20),
(7, 48), (34, 75)

If a person is y years old, then the person is h inches tall.

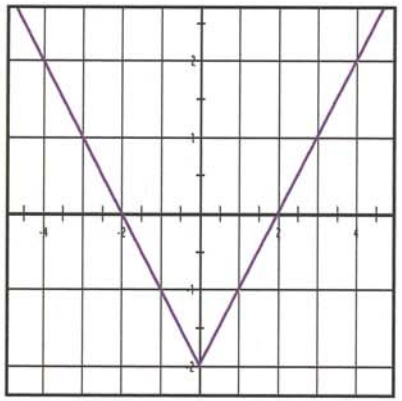
Height	Shoe Size
61	6
62	7
63	7
64	7.5
65	7
66	8
67	9

IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?
IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?
IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?	IS IT A FUNCTION?

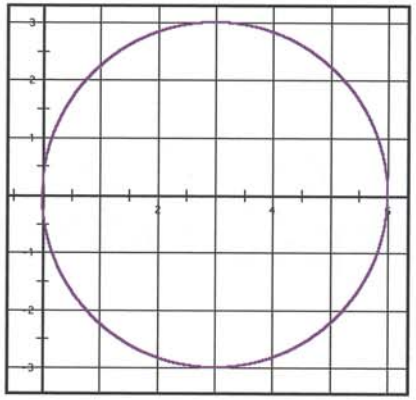
(56, 61.5), (15.5, 71), (36, 72), (34, 61.5), (31, 63), (29, 66), (25, 63), (3, 30), (3, 30), (0.2, 20), (7, 48)

If a person is h inches tall, then the person is y years old.

Favorite Breakfast	Person
Eggs	Bern, Greg
Pancakes	Wang Xu
French Toast	Andy, Kathy
Bagels	Chloe
Yogurt	Jeanne, Janna
Fruit	Annette

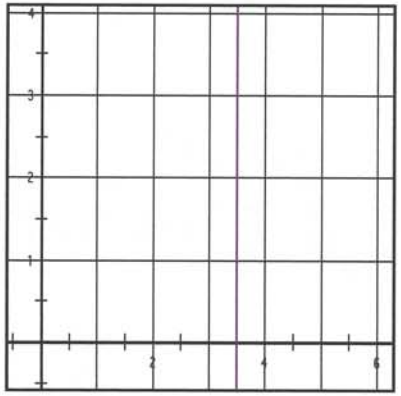


Menu Item	Cost
Burger	$1
Fries	$1
Yogurt Parfait	$1
Apple Pie	$1
Soft Drink	$1
Side Salad	$1
Sundae	$1



The cost of filling a car with gasoline depends on the price of the gas per gallon.

(1, 2), (2, 3), (3, 4), (4, 3), (3, 2), (2, 1)



Country	Continent
United Kingdom	Europe
France	Europe
Spain	Europe
Turkey	Europe, Asia
United States	North America
Mexico	North America
Brazil	South America

(day, night), (short, tall), (cool, warm), (inside, outside), (before, after), (top, bottom), (bottom, top), (head, tail), (sad, happy), (cool, nerd)

The price of gas per gallon depends on the number of gallons of gas available for sale.

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